TANGELO TRIALS

CARBOXIPOLYOL technology is based on compounds that emulate the natural chelation and complexation from the plant, which may complement soil nutritional management, potentiate photosynthesis processes, translocation of photoassimilates.

CARBOXYPOLYOLS are molecules of organic origin from plant extracts of low molecular weight and highly soluble in water, obtained from the transformation of carbohydrates to aldonic acids that bind to a metal ion to form stable compounds in water and soil through ionic bonds and covalents.

Innovation in Vegetable Chelates and biostimulants.

Vegetable organic chelates and complexes, Eco friendly, nano poly-ionic.

Efficiently management and correction of nutritional deficiencies (Ca, Mg, B, Zn, Cu, Mn, Fe).

Environmental stress management.

Power compensator in critical times of cultivation

Improves stability and promotes mix compatibility.

High concentration in the formulation.

Nutrition and plant health.

Trial details

1. **Location:**

Country: Colombia
Department: Cundinamarca
Municipality: Pandi

2. **Planting density:** 89 plants/acre
3. **Plant phenology:** Flowering
4. **Volume of water:**
   - **Foliar:** 47.1 gal/acre
   - **Drip**: 94.1 gal/acre

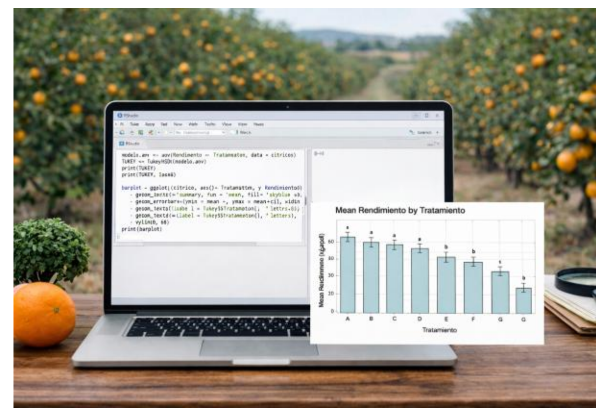
Three applications every 15 days Drip and foliar.

Methodology.

#	Treatment	Application	Doses
1	Control	---	----
2	A.Algaplant-F	Foliar	2 quart/ Acre
3	A. Kfruto –F	Foliar	2 quart/ Acre
4	G. CalcioBZn-F	Foliar	2 quart/ Acre
5	G. HierroMn-F	Foliar	2 quart/ Acre
6	G. Zinc 300-F	Foliar	2 quart/ Acre
7	A.Algaplant-D	Drench	4 quart/ Acre
8	A. Kfruto – D	Drench	4 quart/ Acre
9	G. CalcioBZn- D	Drench	4 quart/ Acre
10	G. HierroMn – D	Drench	2 quart/ Acre
11	G. Zinc 300-D	Drench	2 quart/ Acre

Data analysis and statistics

- Statistical analyses were performed using **RStudio**.
- Assumptions of normality were assessed using the **Shapiro–Wilk test**
- Homogeneity of variances was evaluated using **Levene's test**.
- Data were subject to three-way Analysis of Variance **(ANOVA)**
- Different **letters indicate significant difference between treatments** according to **Tukey** (HSD) multiple range test at $P < 0.05$.



ALGAE AND PROTEIN HYDROLYSATE BASED PLANT FERTILIZER

GUARANTEED ANALYSIS

Total Nitrogen (N)....................................2.50%

2.50% Water Soluble Nitrogen

Soluble Potash (K_2O)................................5.0%

Density a 68°F: 10,01 Lbs/gal

Ingeplant Carboxi poliol®

ACTIPHYL Kfruto

LIQUID COMPLEX FERTILIZER WITH K, P, B, Zn and Molybdenum

GUARANTEED ANALYSIS

Total Nitrogen (N)...................................... 0.22%
0.22% Water Soluble Nitrogen
Available phosphate (P_2O_5)........................19.4%
Soluble Potash (K_2O) 21.5%
Magnesium (Mg)...0.6%
Boron (B)...0.85%
Molybdenum (Mo)....................................0.032%
Zinc (Zn)..0.85%

Density at 68°F: 12.68 Lbs/gal

Ingeplant Carboxi poliol®

GLUKOPLANT CalcioBZn

CONCENTRATED SOLUBLE FERTILIZER WITH Ca, B, Zn and Molybdenum

GUARANTEED ANALYSIS

Total Nitrogen (N)..4.6%
4.6% Nitrate Nitrogen
Soluble Potash (K_2O).................................4.2%
Calcium (Ca)..7.0%
Boron(B)..1.2%
Molybdenum (Mo) 0.04%
Zinc (Zn)... 2.3%

Density at 68°F: 12.09 Lbs/gal

Ingeplant Carboxi poliol®

GLUKOPLANT

HierroMn

CONCENTRATED SOLUBLE IRON, MANGANESE AND MOLYBDENUM FERTILIZER

GUARANTEED ANALYSIS

Total Nitrogen (N) 1.00%

% 1.33 Water soluble Nitrogen

Soluble Potash (K_2O)................................4.00%

Iron (Fe)..4.79%

Manganese (Mn)..2.12%

Molybdenum (Mo)....................................0.10%

GLUKOPLANT Zinc

HIGH CONCENTRATED SOLUBLE ZINC FERTILIZER

GUARANTEED ANALYSIS

Total Nitrogen..0.3%

0.3% Water soluble Nitrogen

Soluble Potash (K_2O)....................................5.0%

Zinc (Zn)..22.0%

Variables

Fruit

Equatorial diameter

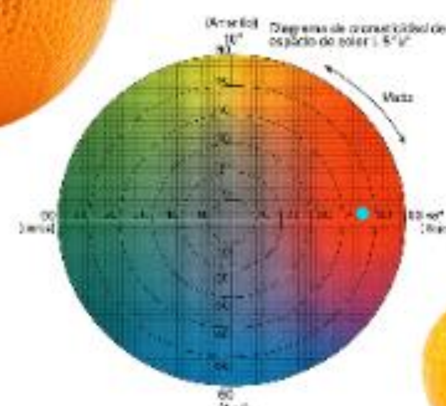
Longitudinal diameter

Sap : Nitrates, Calcium and Potassium

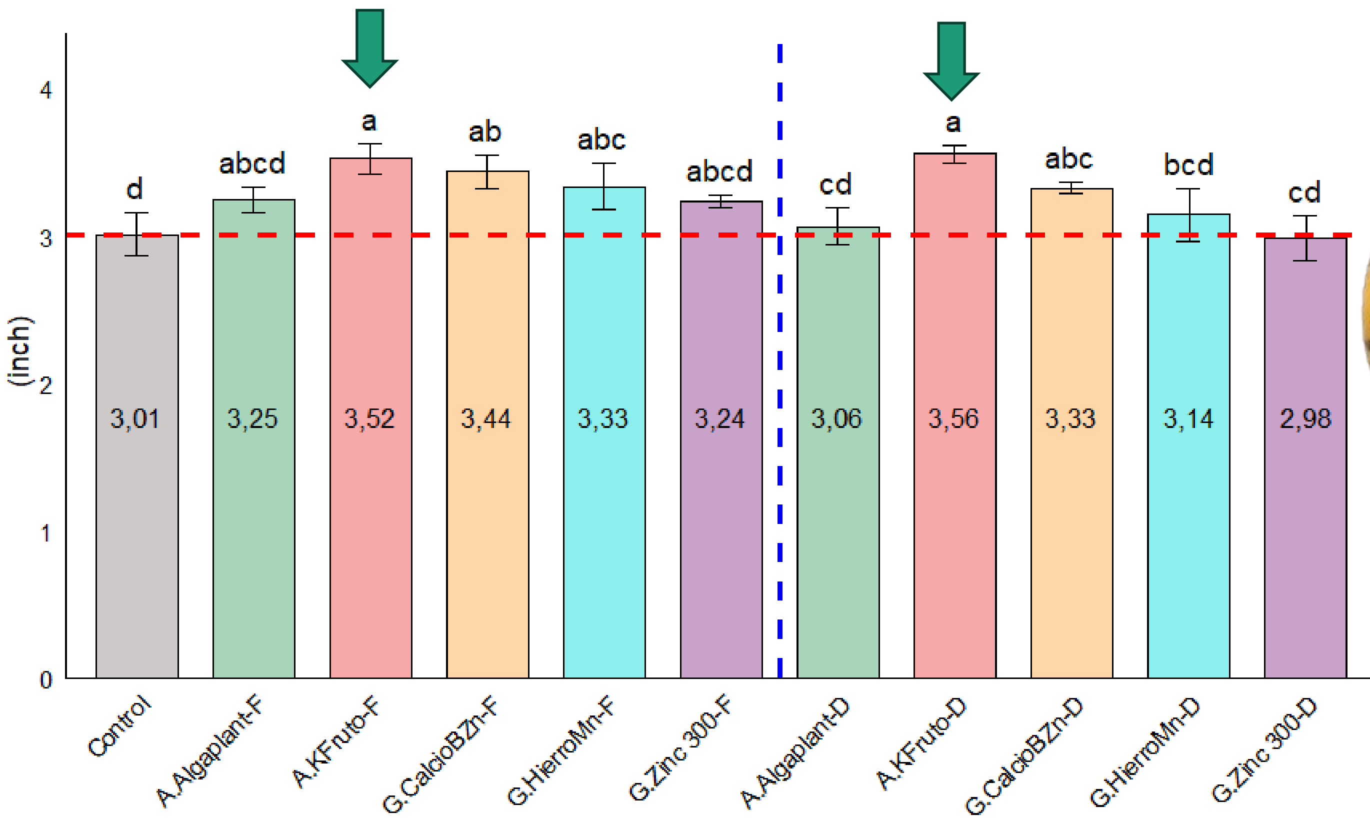
°Brix

Firmness (N)

Fruit color

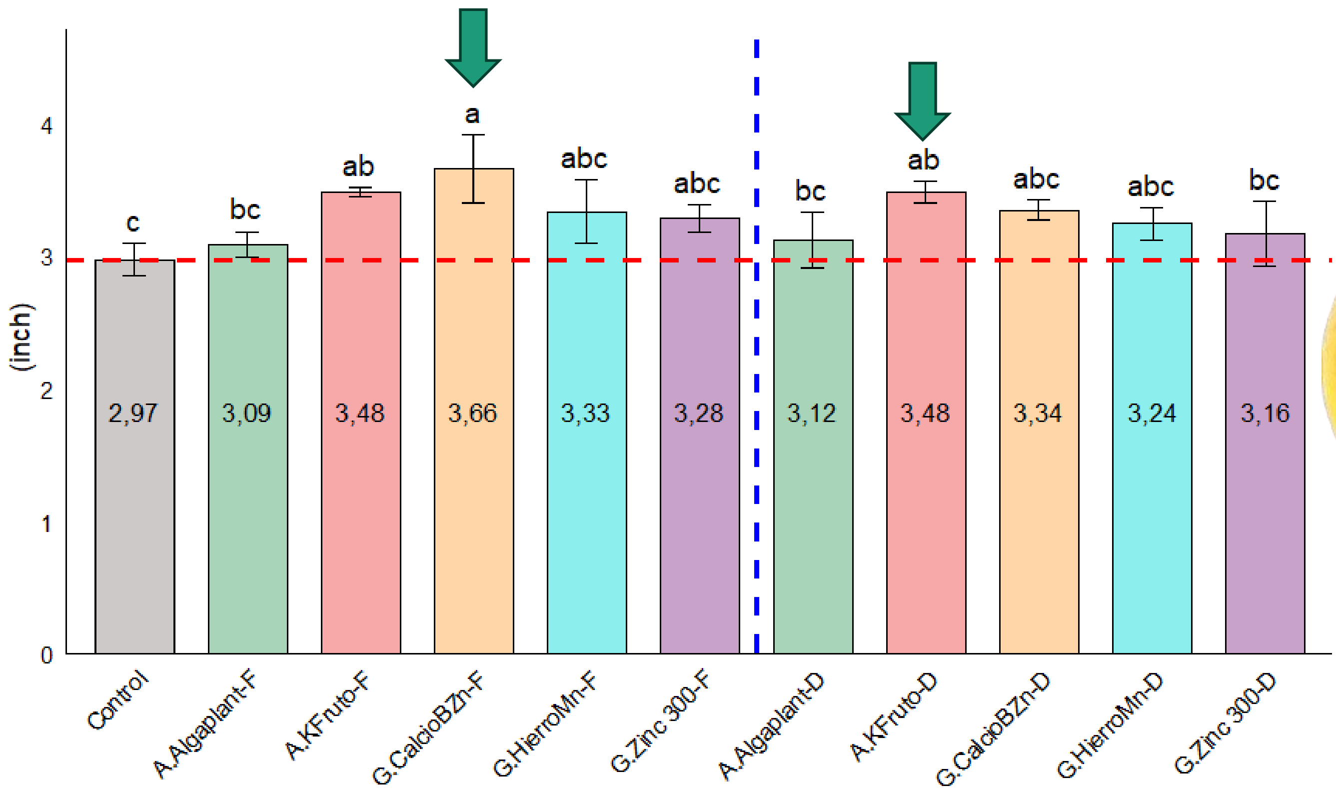


Equatorial diameter (inch)



Increase from 10,6% to 18,32%

Longitudinal diameter (inch)

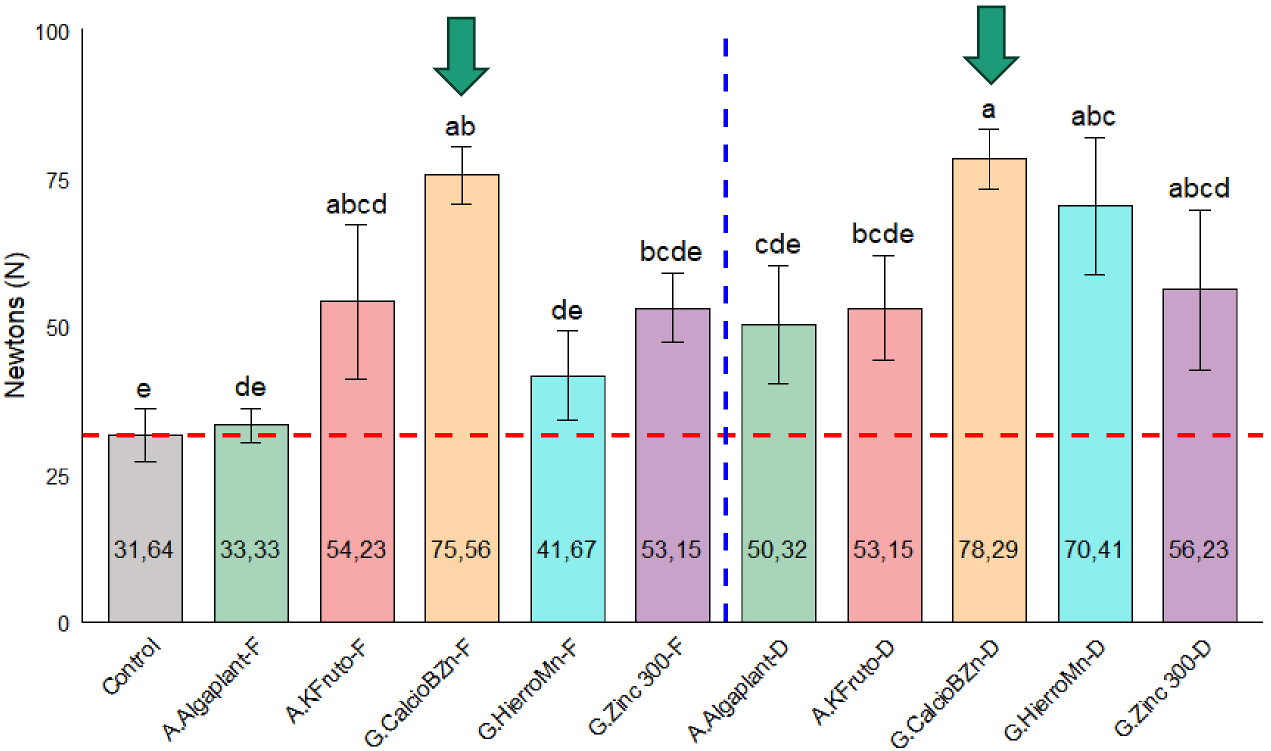


Increase from 16,09 % to 23,04%

Ingeplant Carboxi poliol®

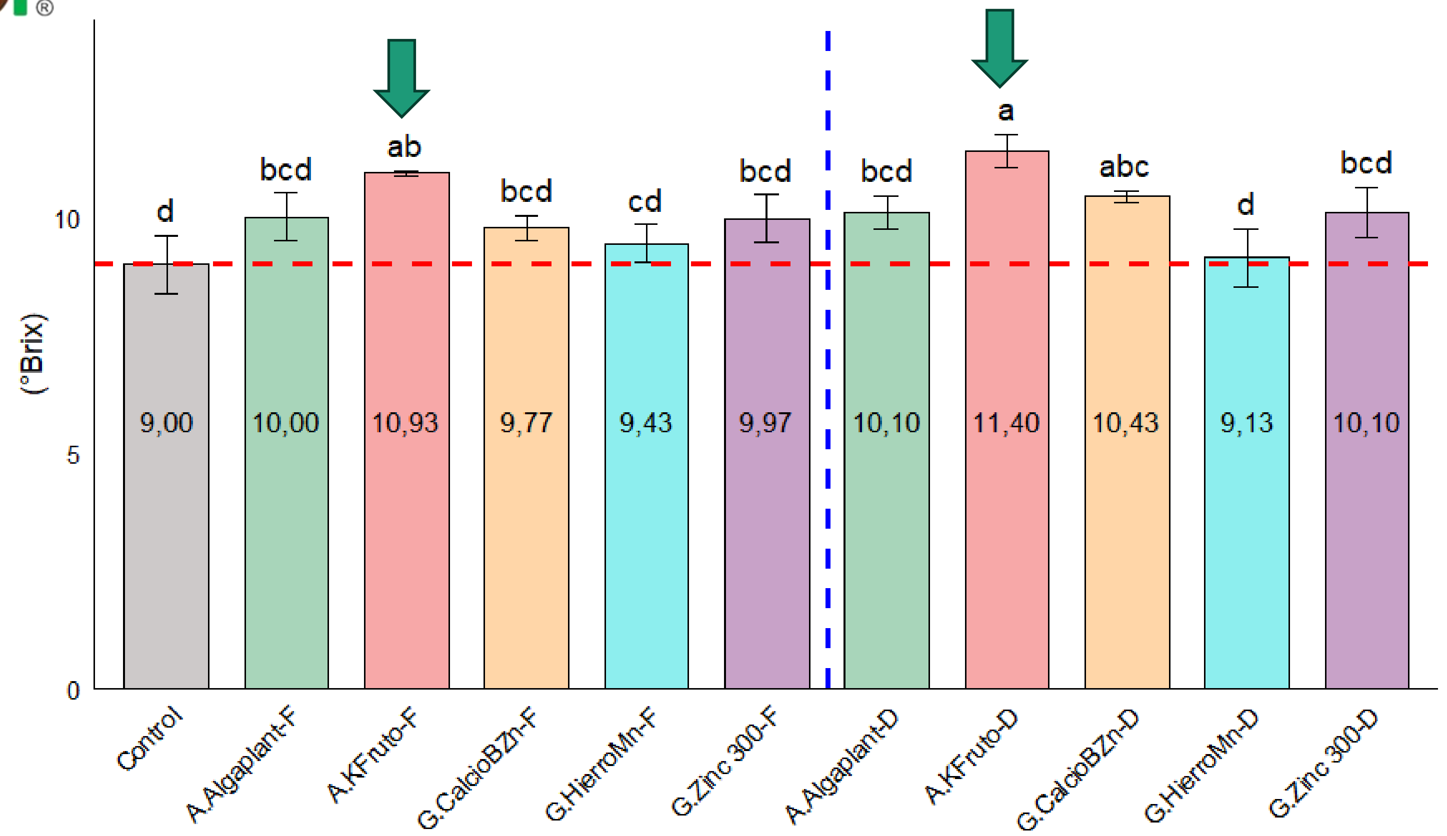
Firmness (N)

Video



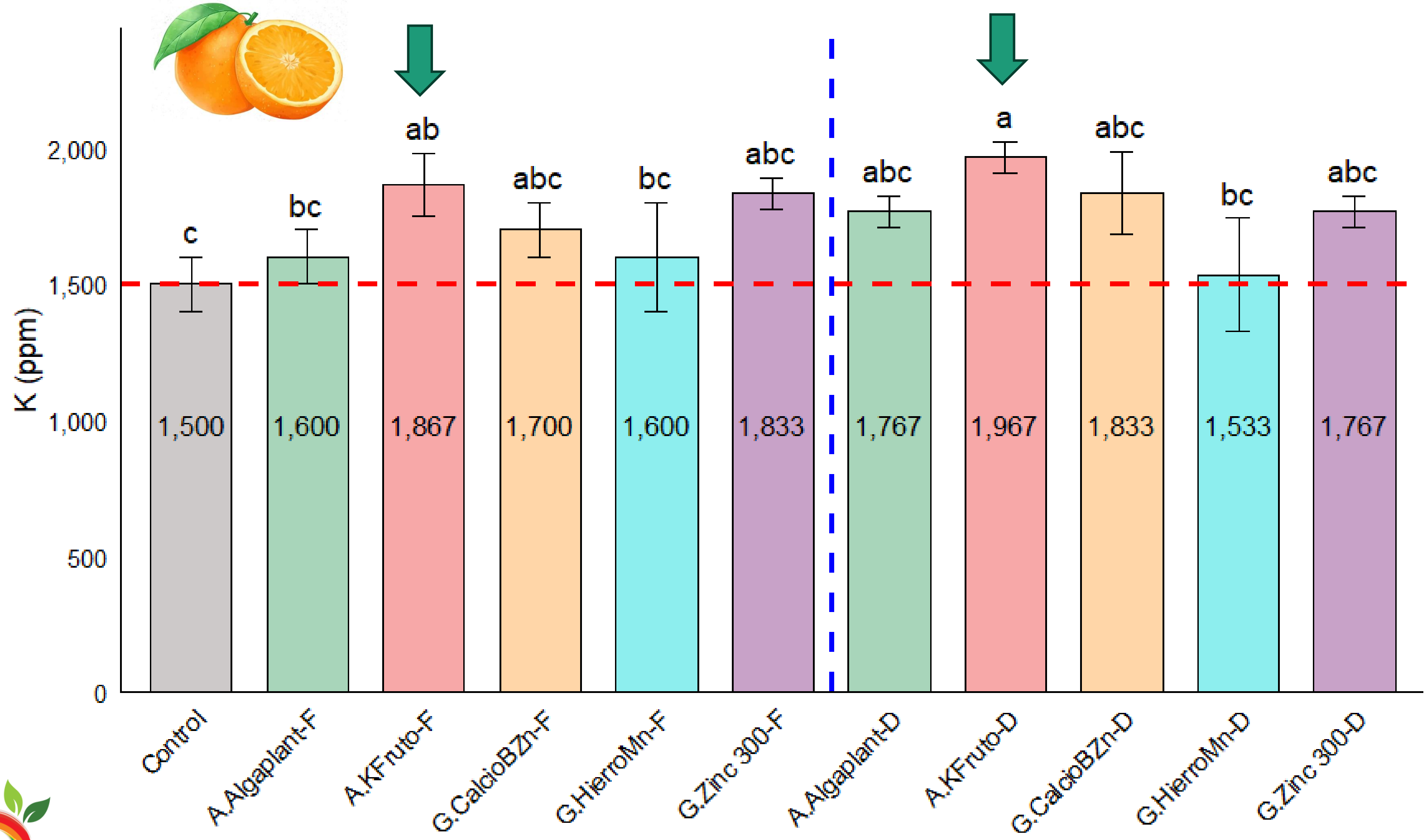
Increase from 77,8% to 147%

Total soluble solids



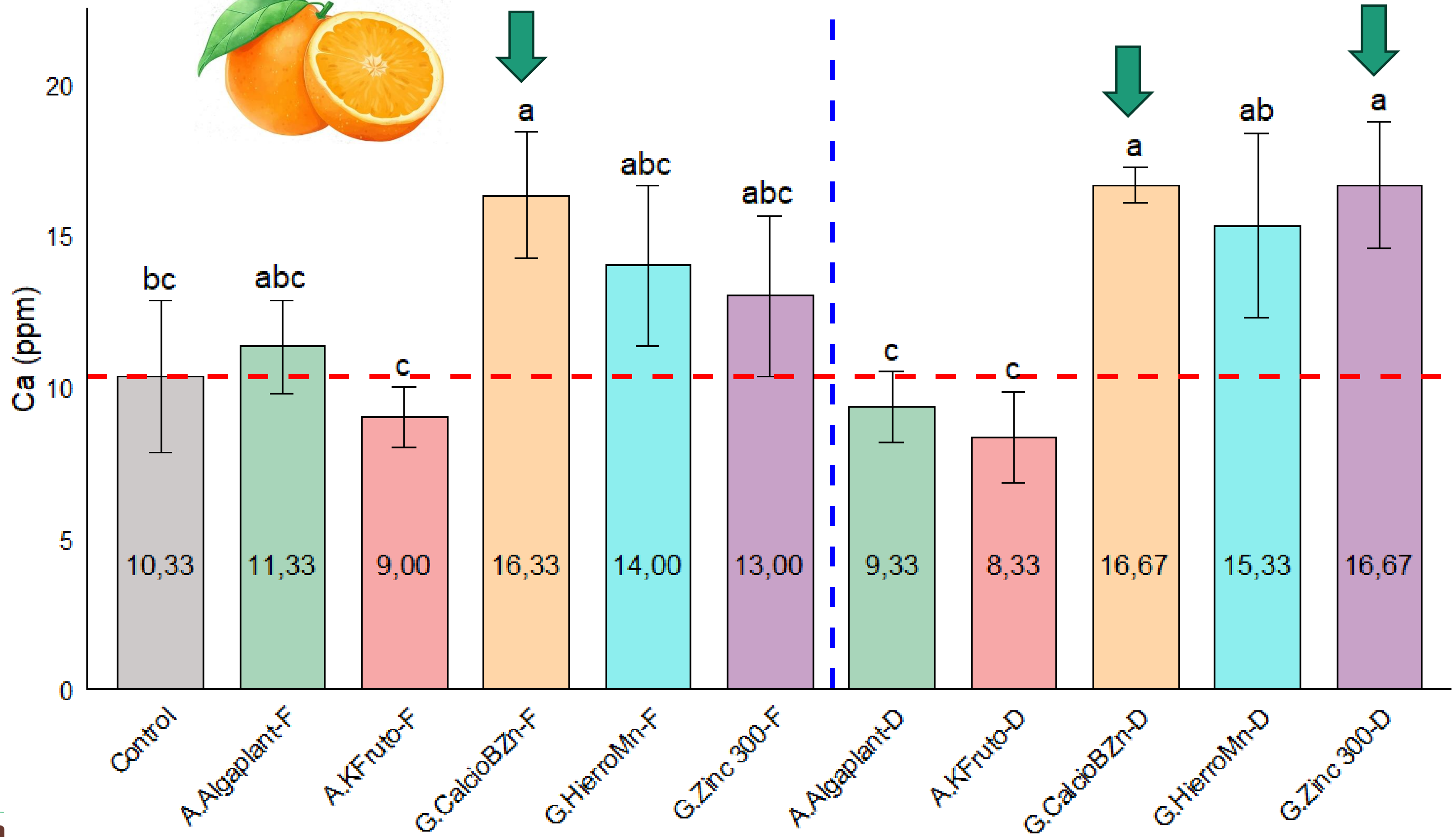
Increase from 21% to 26,6%

Potassium in fruit juice



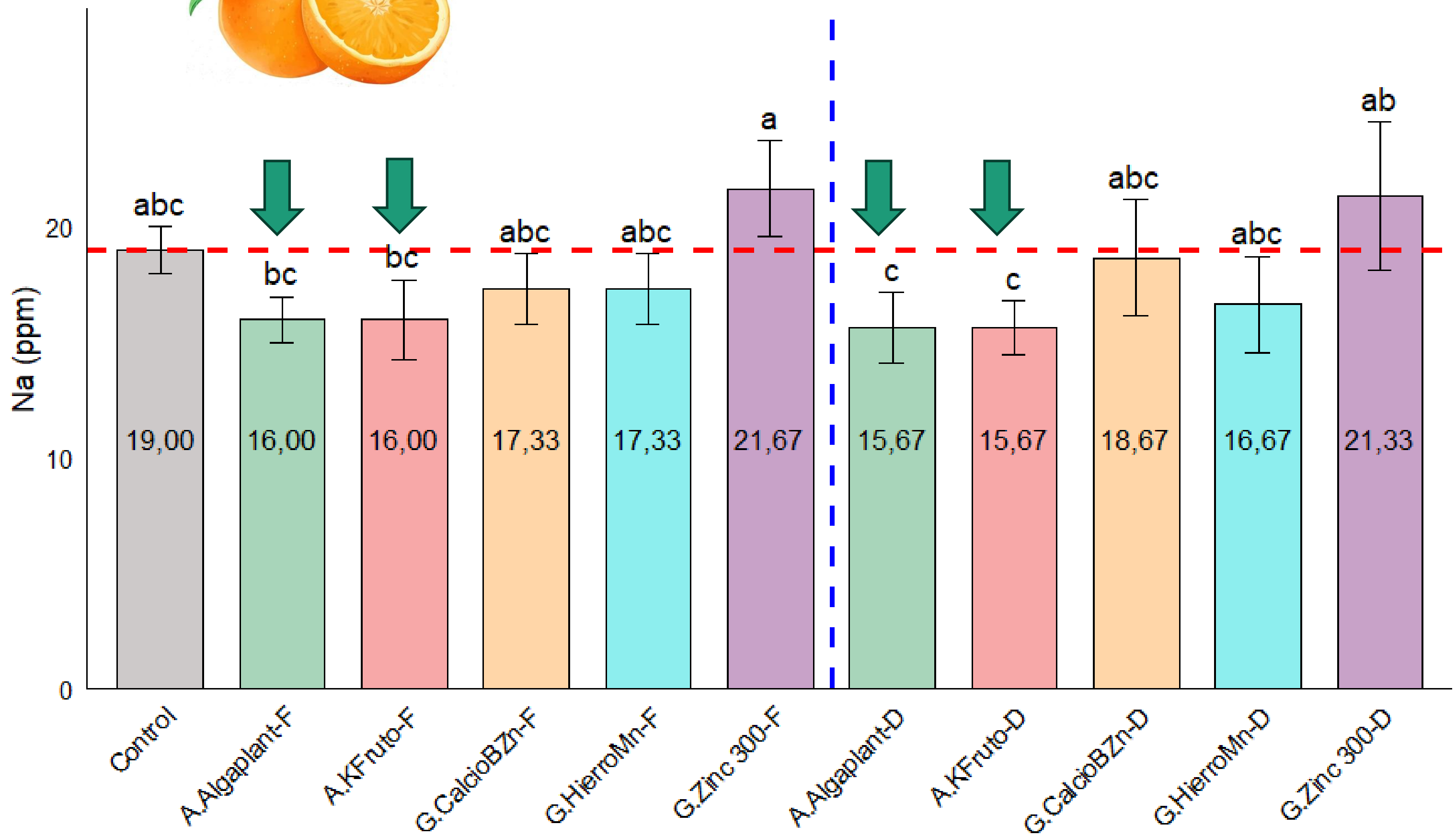
Increase from 24,4% to 31,11%

Calcium in fruit juice



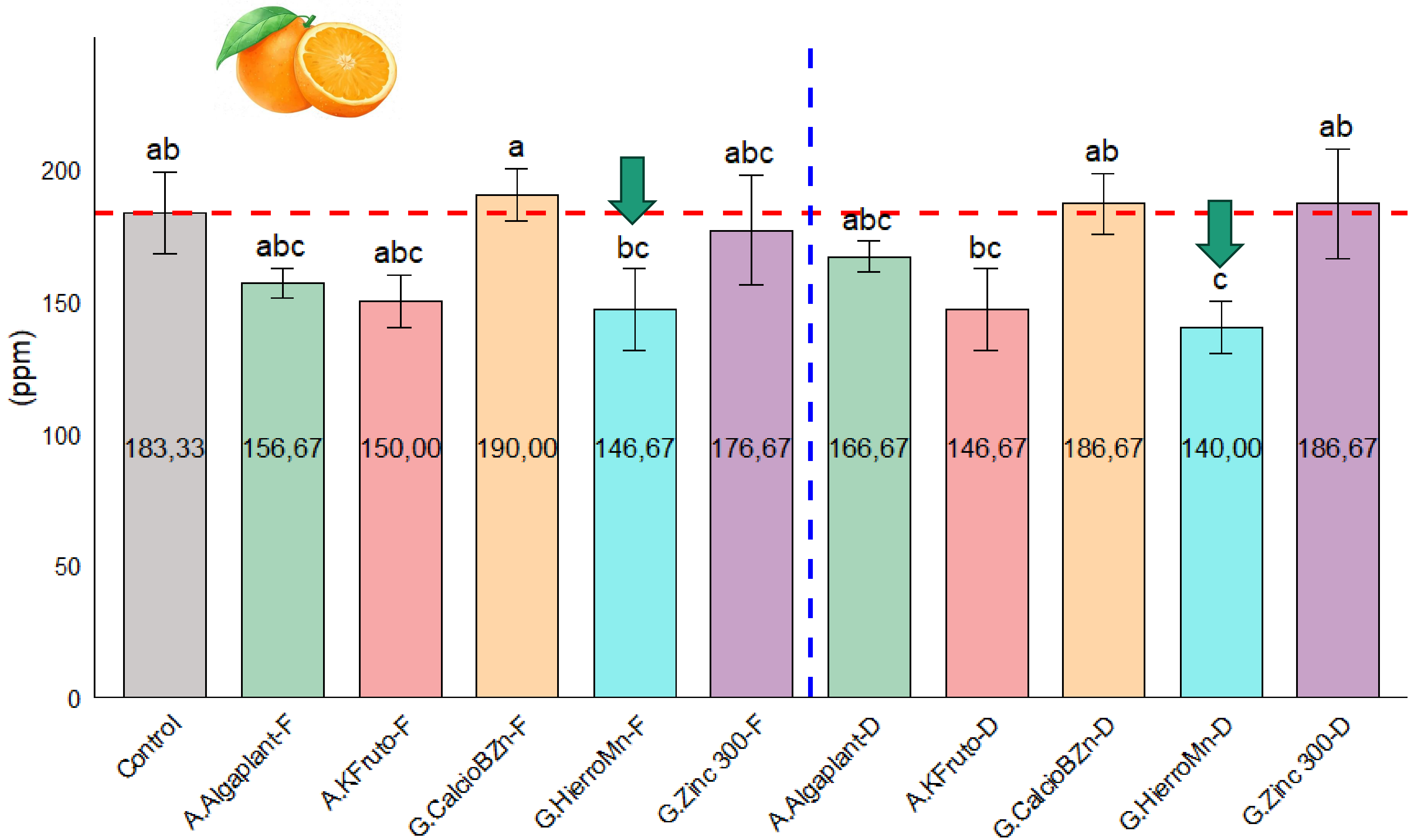
Increase from 58,2% to 62,2%

Sodium in fruit juice



Decreased from 15,8 % to 17%

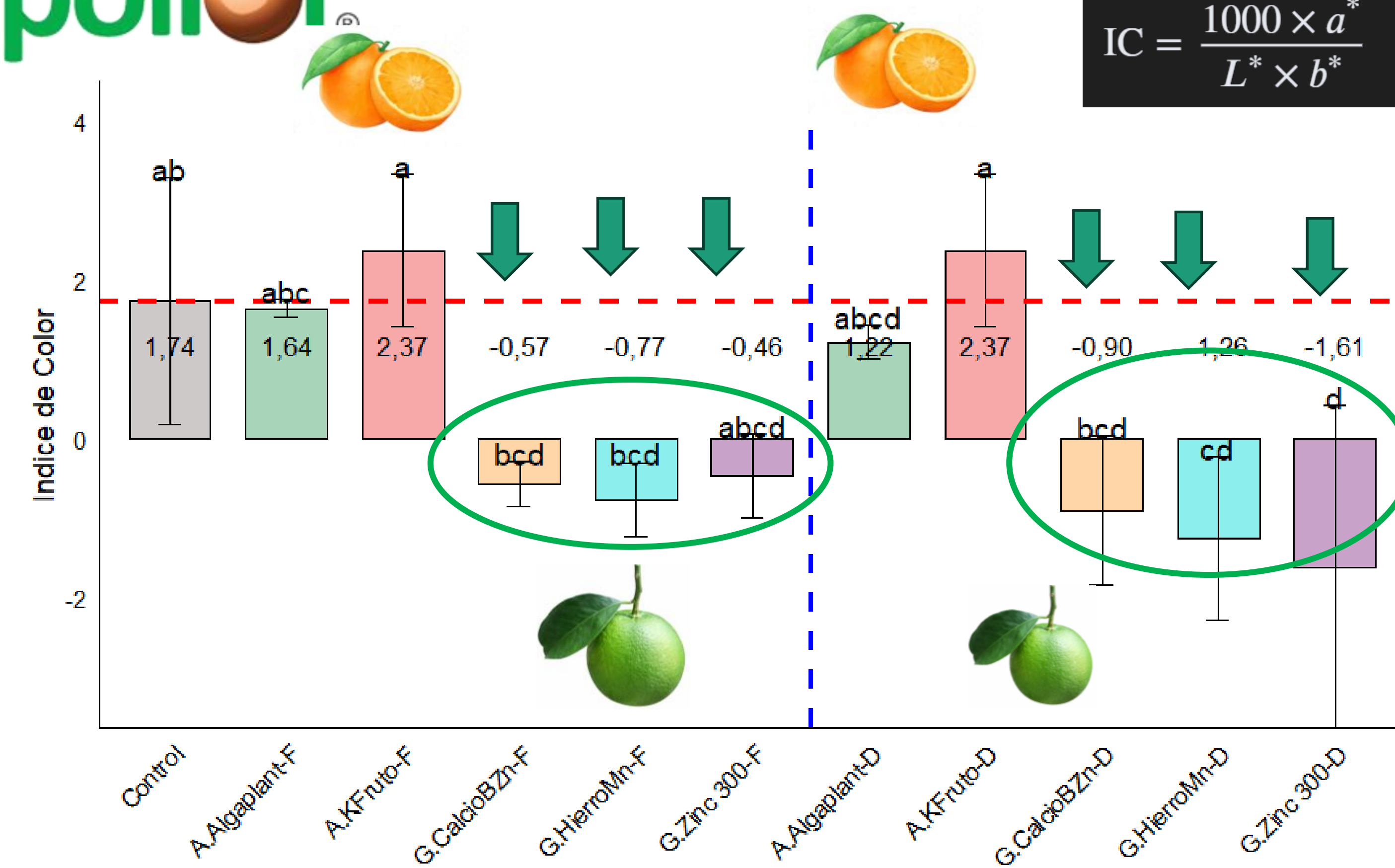
Nitrates in fruit juice

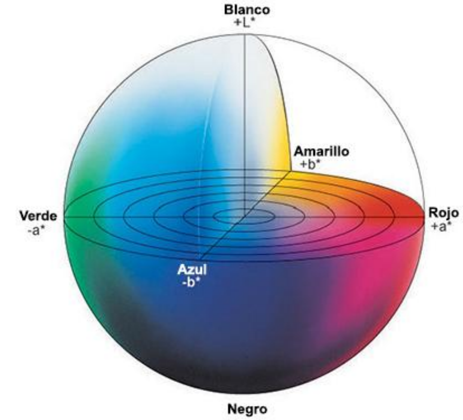


Decreased by 23,62% --**HierroMn**

Color index

$$IC = \frac{1000 \times a^*}{L^* \times b^*}$$





"A negative color index indicates green, less mature fruit and **slower ripening**."

Fe is a cofactor for many redox enzymes involved in the **chlorophyll synthesis** (Canovas et al., 2025)

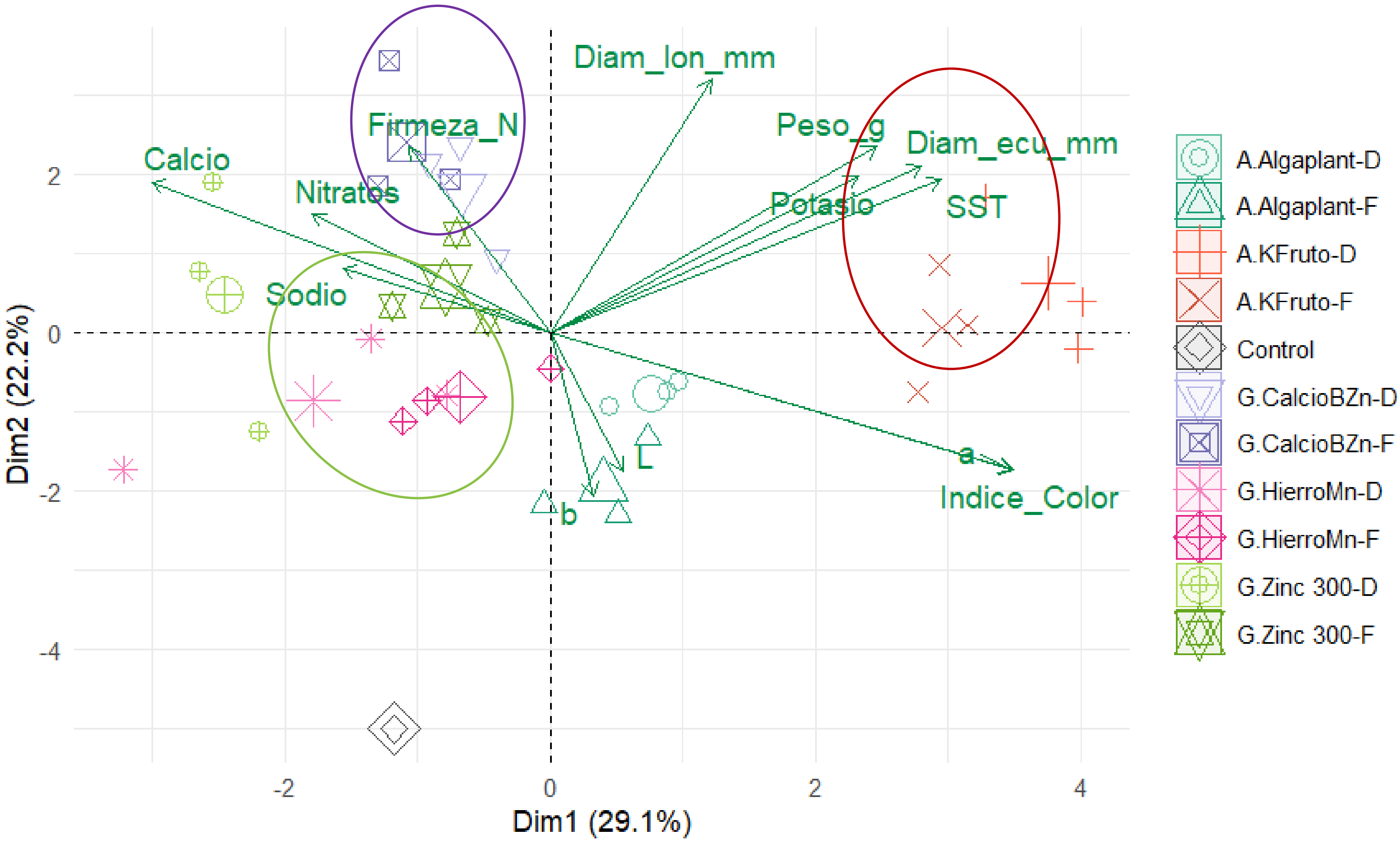
Spearman's correlation

	Diam_ecu_mm	Diam_lon_mm	Peso_g	SST	Nitratos	Calcio	Potasio	Sodio	L	a	b	Firmeza_N	Indice_Color
Indice_Color	0.25	-0.02	0.12	0.41	-0.26	**-0.67**	0.24	-0.23	0.24	**0.99**	0.03	-0.41	1
Firmeza_N	0.11	0.26	0.19	0.01	0.28	0.42	0.2	0.08	0.07	-0.39	-0.01	1	
b	0.09	-0.12	-0.04	-0.16	-0.28	0	-0.11	0.09	0.57	0.03	1		
a	0.27	-0.01	0.12	0.43	-0.23	**-0.67**	0.24	-0.19	0.22	1			
L	-0.12	-0.18	0.04	0.16	-0.16	-0.06	0.19	0.09	1				
Sodio	-0.27	-0.22	-0.24	-0.04	0.57	0.28	0.1	1					
Potasio	0.34	0.31	0.45	**0.6**	0.18	-0.23	1						
Calcio	-0.22	0.03	-0.19	-0.23	0.4	1							
Nitratos	-0.23	-0.11	-0.15	-0.03	1								
SST	0.44	0.38	0.59	1									
Peso_g	0.55	0.5	1										
Diam_lon_mm	**0.82**	1											
Diam_ecu_mm	1												

Spearman: 1.0, 0.5, 0.0, -0.5, -1.0

- **Potassium** enhances total soluble solids, **improving fruit sweetness and quality**.
- Higher **calcium** levels reduce the a* value (color index), indicating **slower ripening**.

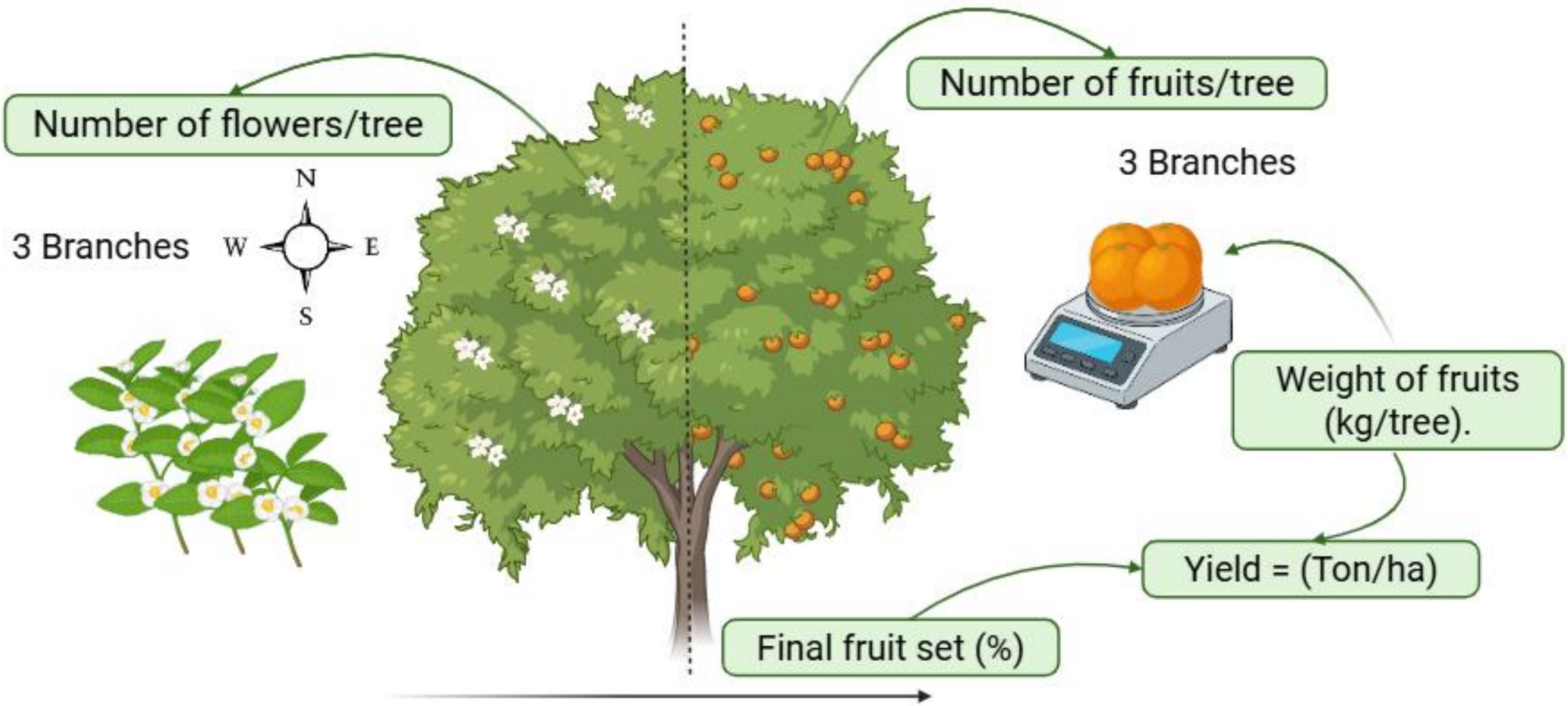
Principal Component Analysis (PCA)



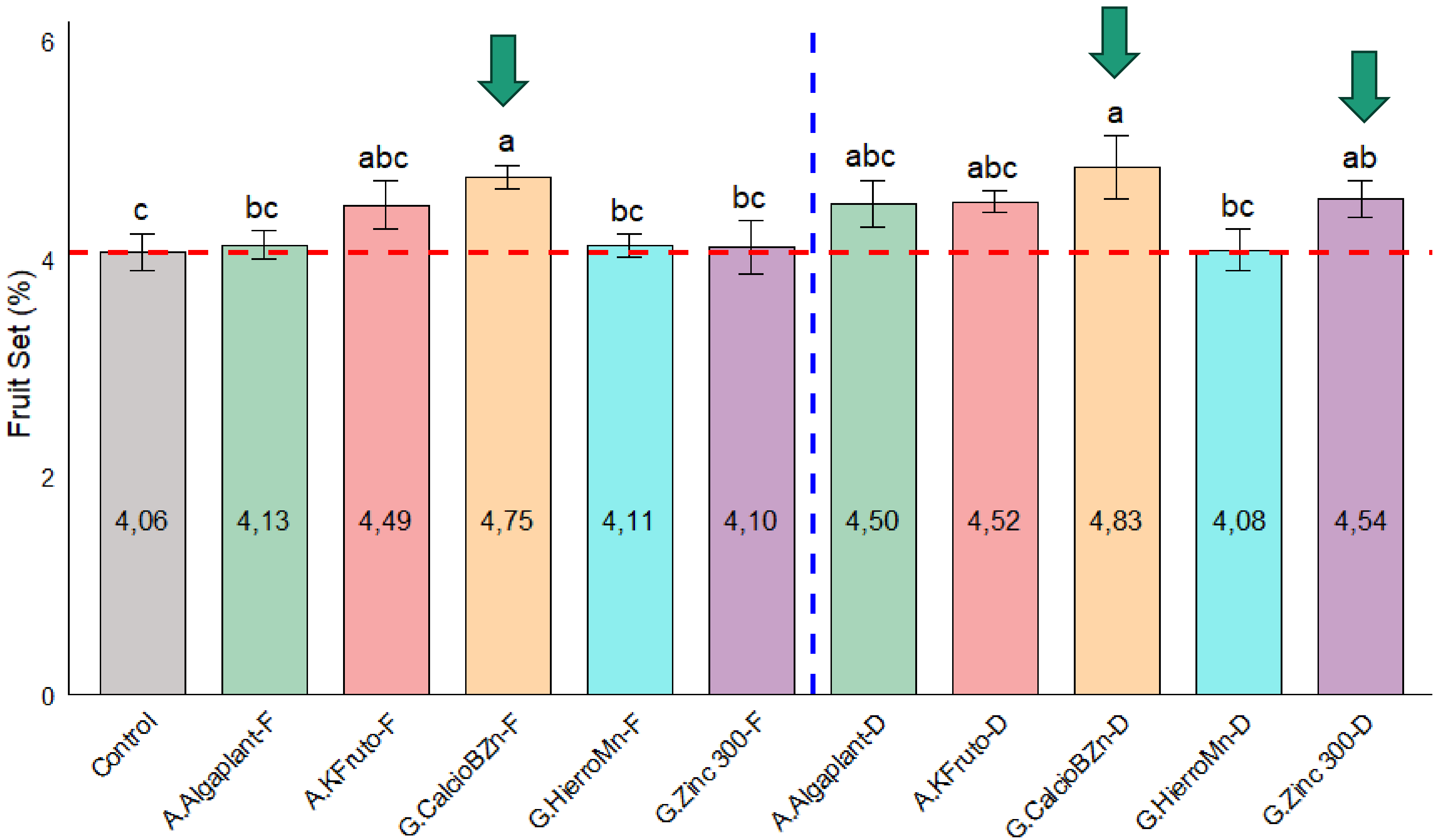
- **G. CalcioBZn** is strongly associated with **higher firmness**.
- **A. Kfruto** is associated with quality, size, and **weight variables**.
- The **color index** (greater ripening) is **inversely** related to G. Zinc300, G. CalcioBZn, and G. HierroMn.

Variables

Plant

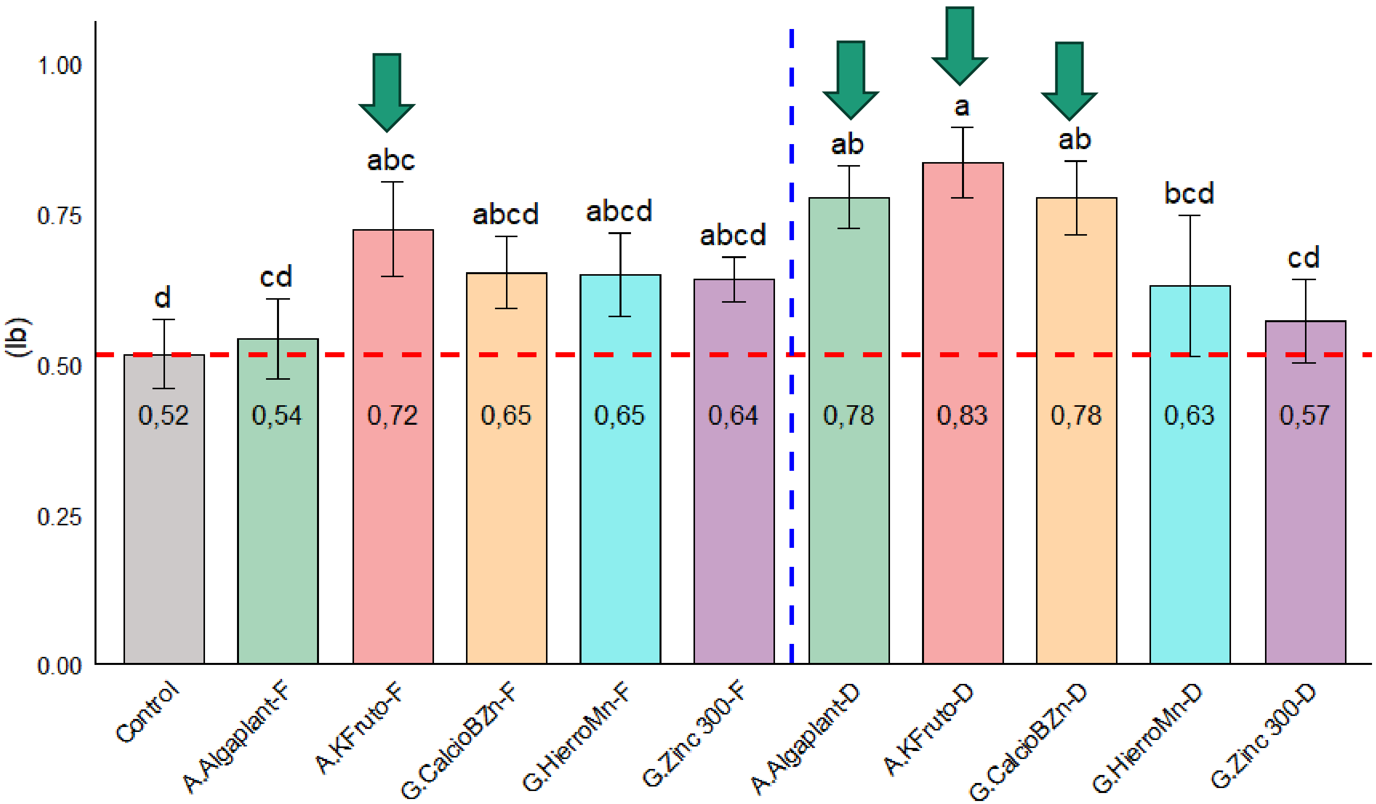


Final fruit Set (%)



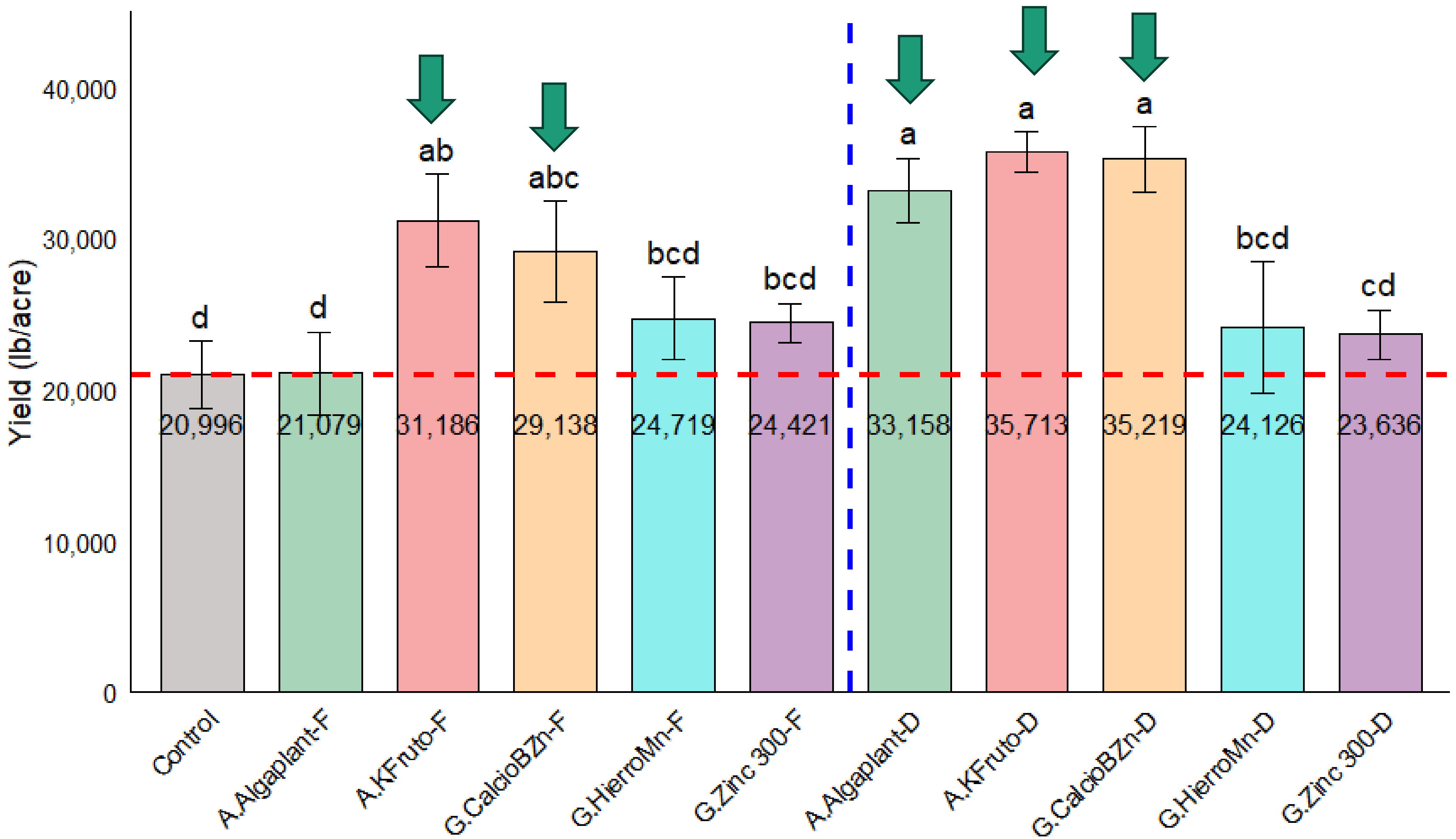
Increase from 9,75% to 18,9%

Fruit weight (lb)



Increase from 40,17 % to 61,53%

Yield (lb/acre)



Increase from 38,79% to 70%

Summary

Organoleptic Quality

- Yield (Drip 70 %, Foliar 48,53%)
- Total soluble solids (26,6%)
- Equatorial diameter (18,32%)
- K+ Concentration in Fruit Sap (31%)
- Decrease in sodium content in fruits (17%)
- Decrease in nitrate levels in fruits (Drip 19,96%, Foliar: 18%)
- Fruit Set (11,3%-Drip)
- Ripening

Postharvest quality

- Firmness (147 %)
- Fruit set %: (Drip 18,9%, Foliar: 17%)
- Ca+ concentration in fruit sap (62,13%)
- Yield (67,7%)
- Reduces the **color index** while preserving the green color of the fruit during harvest
- Longitudinal diameter (23%)

Potassium

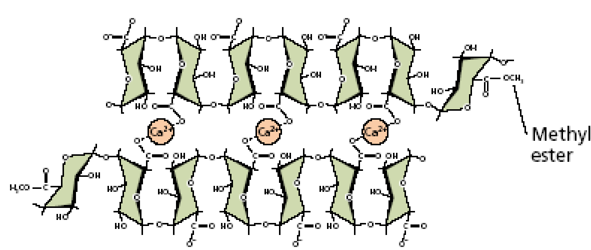
- K in citrus influences cell swelling pressure, which is positively correlated with **fruit sugar** content and **hardness**
- K in citrus promoted photosynthesis in source leaves, thus **enhancing sugar** metabolism and accumulation in sink organs

(Wu et al., 2024)

Calcium

- Ca inhibits the solubilization process and reduces the rate of **tissue softening**.
- It preserves the structural integrity of the cell wall and **maintains cell cohesion.**
- Calcium is associated with fruit ripening processes and **postharvest storage life**.
- It delays ripening, **reduces respiration**, and **delays ethylene production** and the climacteric stage.

(B) Ionic bonding of pectin network by calcium



(Guerrero et al, 2024)

ACTIPHYL ALGAPLANT

- **Fruit set %** with drip application (10,8%)
- Decrease in **sodium** content in fruits (17%)
- Yield (57,92%)

GLUKOPLANT HierroMn

- Reduced postharvest pigment degradation
- Decrease in **nitrate** levels in fruits (23,6%)
- Increase firmness(122%).
- Ca+ concentration in fruit with drip application (48,5%)

GLUKOPLANT

Zinc

- Reduces the **color index** while preserving the green color of the fruit during harvest
- Higher **firmness** with drip application (77%).
- Ca+ concentration in fruit with drip application (62,13%).
- **Fruit set %** with drip application (11,8%)

Ingeplant

Crop Nutrition Engineering

Thank you for your attention

References

- Cánovas, A., Jurado-Mañogil, C., Diaz-Vivancos, P., & Hernández, J. A. (2025). Effect of Reduced Iron Chelate Fertilization on Photosynthesis, Stress Parameters, and Yield of Mandarin Trees. *Agronomy*, *15*(11), 2622.
- Guerrero, M., Álvarez-Herrera, J. G., & Fischer, G. (2024). Effect of calcium on fruit quality: A review. *Agronomía Colombiana*, *42*(1), 1-14.
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